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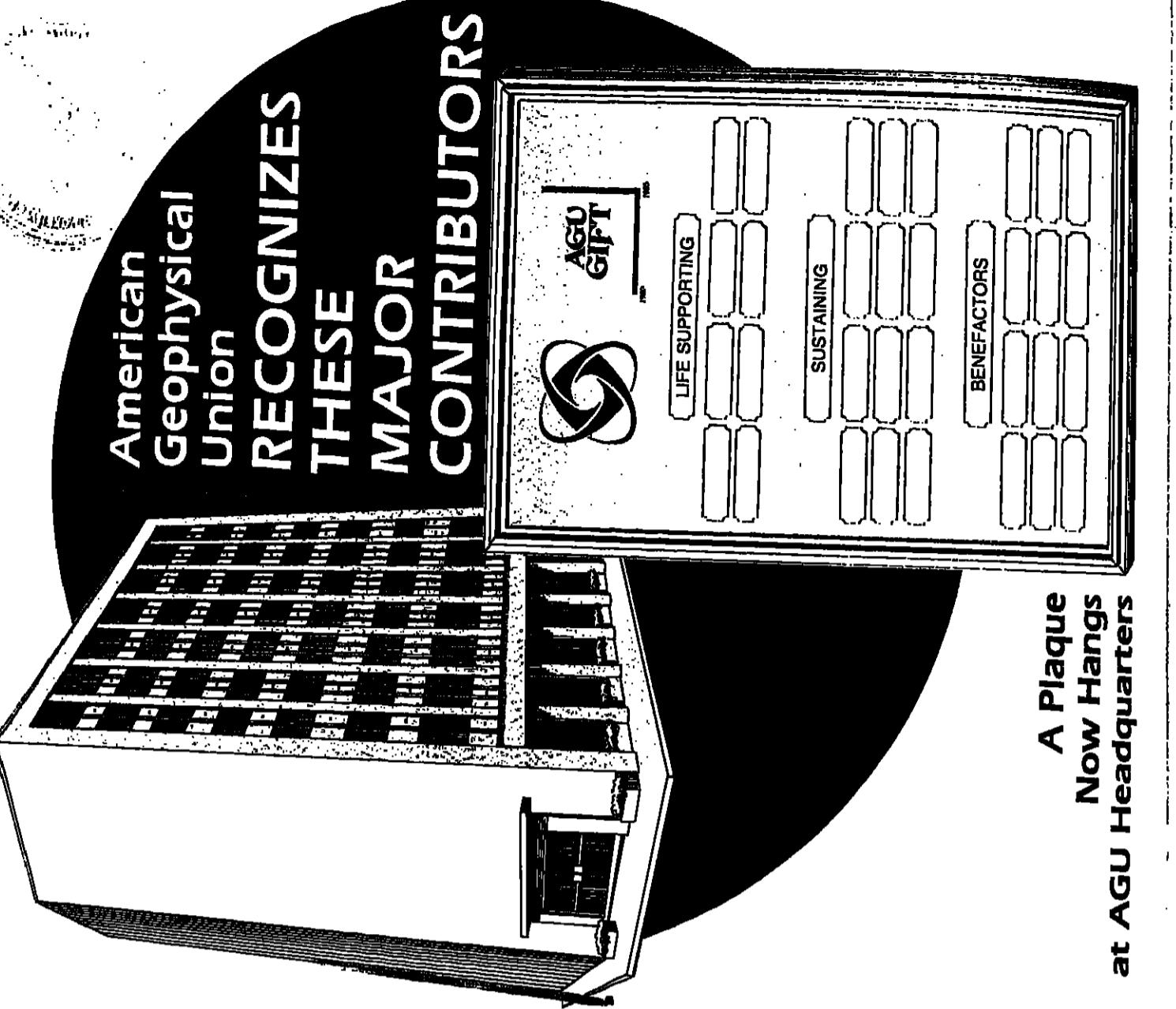
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Vol. 64, No. 19, Pages 369-376

May 10, 1983

Planetary

6570 Surface of Phobos
PHOEBE: VOYAGER 2 OBSERVATIONS
P. Thomas and J. Veverka (Laboratory for Planetary Studies, Cornell University, Ithaca, N.Y. 14853);
D. Morrison, N. Davies, and T. V. Johnson
Voyager 2 images of Phobos obtained over a period of 24 hours provide information on the size, rotation rate, surface markings and photometric properties of this mysterious object. Phobos is approximately 91% dimmer than the Earth's moon, with a 210 km diameter, a prograde rotation period of 7.65 hours, a 0.25 km diameter, and both the star-integrated lightcurve and the surface markings. Because of the limited resolution of the images, Phobos across the disk of the crater counts cannot be made. Phobos is longitudinally variable from 0.046 to 0.048 of a solar radius (R_s = 0.47 km). The most prominent surface markings are the bright spots at high northern and southern latitudes that have a reflectance 50% greater than the dark, bland areas. These polar caps are centered and do not appear to constitute polar caps. The data are consistent with earlier ground-based spectra that show Phobos is a darker spectrum than does the dark side of Iapetus; however, this is not consistent with single containing surfaces (Saturn, J. Geophys. Res., Ed., Paper 380590)

6570 Surface of Phobos
WITH LATENT VELOCITY CHANGES
P. Thomas and L. M. Veverka (Naval Institute of Geophysics, University of Hawaii, Honolulu, Hawaii 96823)

A new method of modeling zero offset reflection data accommodates both vertical and lateral velocity variations that allows continuous changes in reflectivity through the seismometer. Each point in the subsurface at each point is distributed and different curves that would be observed if it were the only source in the subsurface. When the velocity varies only with depth, the diffraction curves are relatively simple and do not require extensive ray tracing. However, if the velocity varies with depth, the diffraction curves are more complex and require ray tracing. For each depth point, these new ray paths are used to calculate travel time perturbations due to the lateral varying part of the velocity. The travel time perturbations are added to the diffraction curves to obtain an approximation to the correct diffraction curves (Synthesis, reflections).

J. Geophys. Res., Ed., Paper 380557

Seismology

6570 Body Waves
A METHOD FOR MODELING REFLECTION DATA FROM MEDIA WITH LATENT VELOCITY CHANGES
P. Thomas and L. M. Veverka (Naval Institute of Geophysics, University of Hawaii, Honolulu, Hawaii 96823)

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J. Geophys. Res., Ed., Paper 380557

Tectonophysics

6570 (Plate tectonics)
ACCREDITED TERRAINS IN THE NORTHERN PART OF THE PHILIPPINE ARCHIPELAGO
D. R. Kerr (Department of Geological Sciences, Cornell University, Ithaca, New York 14853)

The Philippines Archipelago consists of a complex array of orophites, continental fragments and island arcs.

These terranes have been increasingly reinterpreted in terms of orogenic zones. The northern Philippines, including Luzon, Mindoro and nearby smaller islands, can be divided into at least six of these tectonic elements.

From north to south across eastern Luzon are the

Mengao orocline, the Central Luzon Arc, the

Boac-Zambales orocline, the Cebu-Catigbian

orocline, and a late Cretaceous-early Paleogene

volcanic belt on an older, more ancient terrane.

These are terranes that are often called the

Philippine Fault. To the south, the western Ilocos

terrane has been accreted onto the Ilocos terrane.

The Ilocos terrane, which itself is colliding with the

North Palawan terrane, is the southernmost terrane

to appear to have originated in back arc basins rather

than in an oceanic plume, and the metamorphic belt has

been induced by deformation and metamorphism.

The Philippines terranes are interpreted as fragments that originated

within the complex Pacific-Eurasian plate boundary.

Within the complex Pacific-Eurasian plate boundary

various terranes have been identified since the

Oligocene by strike-slip and convergent displacement

and/or block displacement, either along transcurrent

faults or as components of convergent plate margins.

Important, if not necessarily unique, in this assembly

are terranes identified in the northern Philippines as

fragments, with attached craton and island arc

margin, characteristics similar to those

usually interpreted for the North American

cordillera, where near-orthogonal convergences and

block slipping terranes are favored.

J. Geophys. Res., Ed., Paper 380116

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J. Geophys. Res., Ed., Paper 380116

Transactions, American Geophysical Union
Vol. 64 No. 19 May 10, 1983

News

Volcanic Event in Soviet Arctic?

An unusual, high-altitude plume originating at Bennett Island (Ostrov Bennett) (76°N, 149.3°E) in the high Soviet Arctic, reminiscent of a volcanic eruption, was discovered during a routine scan of NOAA-6 infrared imagery by the National Weather Service in Anchorage (Bruce Webster, personal communication, 1983). On the cover is an image acquired during satellite pass No. 18949 (NOAA-6) on February 18, 1983, at 00:15:36 UT. The plume originated over the northeastern corner of Bennett Island. The horizontal cross section over the source region is approximately 10 km and the observable length is 250 km. The fine structure of the plume's initial segment suggests the possibility of a multiple source. Three distinct puffs corresponding to separate explosions make up the distal part of the plume.

Preliminary data on aeroel routinely collected at Barrow by the Arctic Air Chemistry group of the University of Rhode Island show that elemental abundances of Al, V, Mn, Br, and Ni were within their normal ranges both before, during and after February 18 (Ken Rahn, personal communication, 1983). The location of the event, if volcanic, is most unusual. The nearest Quaternary volcano on mainland Asia is Balagan-Taa (66.43°N, 143.74°E), a cinder cone with a historic eruption about 1775. That volcano lies ~1300 km SSW of Bennett Island in Siberia. Searching for other possible historic eruptions in the Arctic, we found one reference to an apparent submarine volcanic eruption from a seamount on the flank of the Lomonosov Ridge at 88.27°N, 68.58°W, 1600 km N of Bennett Island (Hauke, 1962). Seamounts, bursting ice, explosive noises, and strong H₂S odors were reported in the area November 21-24, 1957, by a USSR scientific field party on a drifting ice station. Bennett Island lies on the Siberian continental shelf, ~200 km east of the projected intersection of the Lomonosov Ridge with the shelf edge. The Arctic ocean spreading center (Nansen-Gakkel Ridge) intersects the shelf 500 km W of Bennett Island.

A review of Soviet geological literature (M. Chirkov, pers. comm.) indicates that olivine-bearing basalts, perhaps from the Cretaceous period, crop out over much of Bennett Island. Fossiliferous Cambrian and Ordovician argillites, siltstones, and minor sandstone and limestone underlie the basalt. According to a Dr. Ambler, a member of DeLong's shipwrecked party that discovered Bennett Island on July 11, 1881, the weathered 'trap-rock' (basalt) forms prominent bluffs; some of the bluffs show well-developed columnar jointing (DeLong, 1883). The basalt and also the underlying sedimentary basement are flat-lying and undeformed, indicating little tectonic activity since Paleozoic time.

The origin of the main explosive phase is difficult to determine because the wind velocity over Bennett Island at the time in question is not known. There is, however, a volcanic vent. Activity may be continuing, as indicated by the most recent explosion seen on April 8. One would hope that further collaborative evidence will be forthcoming from Soviet colleagues to determine whether there is volcanic activity on Bennett Island. If this is indeed the case, it would have significant implications in the study of the tectonics of the Arctic.

The estimated power released during the February 18 event would be ~10¹² Watts based on the plume altitude of 7 km (Morton et al., 1986). It is unlikely that a time-limited chemical fuel burn could release that much power.

Acknowledgment

This work was supported by research funds appropriated by the State of Alaska to the Geophysical Institute.

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DeLong, Emma (Ed.), *The voyage of the Jeannette: The ship and ice journals of George W. DeLong, Lieutenant-Commander U.S.N., and Commander of the Polar expedition of 1879-1881*, vol. 2, chapter 14, The Riverside Press, Cambridge, Mass., 648-691, 1883.

Morton, B. R., G. Taylor, and J. S. Turner, Turbulent gravitational convection from maintained and instantaneous sources, *Proc. Roy. Soc., Ser. A*, 234, 1-23, 1956.

This news item was contributed by Louis J. Lanzerotti, Bell Laboratories, Murray Hill, NJ 07974.

Satellite Sale Update

A senior Department of Commerce official whose connections with the Communications Satellite Corp. (Comsat) regarding the proposed sale of the weather and land satellites (See, March 22, 1983, p. 113) have been the subject of congressional inquiry has resigned. Comsat is considered the frontrunner of those looking to purchase the satellites.

Guy W. Fiske, Deputy Secretary of Commerce, submitted his letter of resignation on May 10; the resignation became effective May 14. He had been scheduled to testify to two House Science and Technology subcommittees this month on the nature, extent, and propriety of his relationship with Comsat. As Fiske went to press, it was unclear whether Fiske would still be asked to testify.

Comsat allegedly had been lobbying strongly for the Commerce official to back Comsat's purchase of the satellites. Fiske reportedly has been considering leaving government service for several months.

The House of Representatives voted as an amendment to the National Aeronautics and Space Administration authorization bill to block the satellite sale unless Congress gives its express approval. The Senate's version of the same bill is being discussed within the Commerce, Science, and Transportation Committee.

Rep. Harold L. Volkmer (D-Mo.), chairman of the House Space Science and Applications Subcommittee, one of the committees that was to have Fiske testify, was asked what implications the resignation might have on the proposed sale. Volkmer told *EOS*, 'I don't think it will help any.' *BTR*

News (cont. on p. 378)

enough photo coverage to deduce that the main explosive phase must have started after 21:56 UT on February 17 and before February 18, 00:47 UT. Comparison of plume development between 04:37 and 06:15 UT on February 18 (NOAA-6, pass 18942 and 18943) gives an average plume drift of ~60 km/hr.

Seismic records from the Geophysical Institute network do not reveal any event occurring in the vicinity of Bennett Island during the time interval of interest. Our infrasound-detection array in Fairbanks was shut down and our array in Antarctica did not show any signature of an explosive event during the relevant period.

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News (cont. from p. 377)

Stellar Cannibalism

Astronomers have obtained evidence that stars can literally swallow other stars, leading to the ejection of stellar material into space and the formation of extremely close pairs of stars, according to the National Science Foundation (NSF). The discovery supports theoretical predictions of the evolution of double stars.

While studying the central stars of planetary nebulae—disk-shaped gas clouds that vaguely resemble planets—Albert D. Grauer of the University of Arkansas at Little Rock and Howard E. Bond of Louisiana State University at Baton Rouge found that several of these central stars are actually very close stellar pairs. Previously, it had been thought that the central star in a planetary nebula was a single star that expelled a gas cloud as it neared the end of its life. Their latest discovery, the central star of planetary nebula Abel 41, consists of a pair of stars that orbit each other in 2 hours and 43 minutes. The researchers also have found three other central star pairs that have orbital periods of between 11 and 18 hours.

The discoveries support theoretical predictions of the evolution of double stars, the astronomers said. It is believed that when a star exhausts the hydrogen fuel in its interior, it expands to become a huge, cool, red giant. If a star that becomes a red giant happens to have a second star orbiting it—as at least half of all stars do—the companion star may suddenly find itself inside the outer layers of the red giant. Much as an earth satellite's orbit begins to decay once it enters the outer layers of the earth's atmosphere, the swallowed star would then begin a gradual, inward spiral inside the extended atmosphere of the red giant. As the captured star spirals in, it gradually speeds up the rotation of the outer layers of the red giant. This process continues until enough energy is transferred to the outer layers of the red giant to cause them to be expelled, leaving a close pair of orbiting stars surrounded by a nebula gas cloud.

The astronomers used telescopes at Kitt Peak National Observatory near Tucson, Ariz., at Cerro Tololo Inter-American Observatory in Chile, and at the Louisiana State University Observatory. Kitt Peak and Cerro Tololo are national astronomy centers funded by NSF.

NASA Budget in Congress

The House of Representatives has authorized \$161.7 million more than President Ronald Reagan proposed for the fiscal 1984 National Aeronautics and Space Administration (NASA) budget. The House NASA authorization bill (H.R. 2065) passed by voice vote on April 26. Five days earlier, the Senate Commerce, Science, and Technology Committee marked up S. 1098, the Senate's NASA authorization bill, and recommended \$171.6 million more than the Reagan proposal. The Senate is expected to vote on the bill in mid May, after which time a conference committee will iron out the differences between the House and Senate versions.

President Reagan requested a total NASA budget of \$7.108 billion; \$5.7085 billion for research and development, \$150.5 million for construction of facilities, and \$1.2475 billion for research and program management (Eos, February 15, 1983, p. 65).

The House authorized a total of \$7.2682 billion, which includes \$5.8886 billion for research and development, \$157.1 million for

Great Lakes Lab

The Great Lakes Environmental Research Laboratory (GLERL) would close under President Reagan's fiscal year 1984 budget proposal issued on January 31, 1983. GLERL, established in 1974, conducts experimental research in the field and laboratory on the physics, chemistry, and biology of the Great Lakes, their watersheds, sediments, and overlying atmosphere. Closing the lab would represent a cut of more than \$3.6 million from the ocean research program, which is part of the National Oceanic and Atmospheric Administration's (NOAA) ocean and coastal program activity. Also, it would mean dismissing a staff of 90, according to Eugene Aubert, director of GLERL.

Congressional action on the proposed budget cuts for all of NOAA, including the status of the laboratory, is proceeding through hearings and budget markups. The House has completed its hearings and, as Eos went to press, had scheduled a budget markup session for May 11. A Senate Appropriations subcommittee held its hearing on April 26; a budget markup has been tentatively scheduled for late May. GLERL had been proposed to be closed in the fiscal 1983 NOAA budget (Eos, February 23, 1982, p. 169), but was reinstated by Congress.

Support for continued operation of the laboratory was expressed in a letter sent by the entire Michigan congressional delegation on March 21, 1983, to the House appropriations subcommittee conducting hearings on the budget proposal to close GLERL.

Of the 16 NOAA Environmental Research Laboratories (ERL), GLERL is one of three 'wet' laboratories. Present investigations include a study of the lake-scale structure of waves and their propagation characteristics through the use of 16 current meter moorings deployed in Lake Michigan. Also, the basin runoff behavior of the large watershed of Lake Ontario is under study using an independent tank-cascade model; this will develop better forecasting abilities once meteorological information has been supplied. In addition, a program is continuing which investigates the cycling, transport, and fate of toxic organic compounds. Involved in the research are 48 scientists, 30 graduate students, and 12 part-time employees who constitute a support staff.

If GLERL is closed, the fate of this research in progress is unclear. During the April 26 Senate Appropriations subcommittee hearing (Eos, May 10, 1983, p. 972), Sen.

construction at facilities, and \$1.2425 billion for research and program management.

The Senate committee recommended a total budget of \$7.2781 billion; \$5.8885 billion for research and development, and \$1.2411 million for construction at facilities, and \$1.2425 billion for research and program management.

In the five R&D categories (see table), the largest recommended increases over the president's proposal were in technology utilization (150%) and space science and applications (approximately 8%).

Within space science and applications, the House authorized \$52 million more for physics and astronomy programs, with \$46 million of that increase targeted for the space telescope. In addition, all of the House's \$15 million and all of the Senate committee's \$10 million increase for planetary exploration was targeted for research and analysis. The Senate committee recommended increases to physics and astronomy programs of \$50 million for the space telescope, \$5 million for the space plasma lab, and \$5 million for research and analysis. The committee recommended cancelling \$16 million proposed by President Reagan for the solar optical telescope—B7R.

Status of NASA FY 1984 Research and Development Budget, in Millions of Dollars

Activity	Reagan Proposal	House Bill*	Senate Committee Markup 4/21†
Space transportation systems			
Capability development	3498.0	3571.8	3558.0
Operations	1927.4	2001.2	2022.4
Space science and applications	1068.0	1570.6	1556.6
Physics and astronomy	514.6	1182.0	1154.0
Planetary exploration	205.4	566.0	558.6
Life sciences	59.0	220.4	216.4
Space Applications‡	289.0	99.0	59.0
Technology utilization	4.0	10.0	10.0
Aeronautics and space technology	458.3	454.6	466.3
Aeronautics	300.3	311.6	328.3
Space Technology	188.0	148.0	158.0
Tracking and data acquisition	700.2	700.2	700.2
Total research and development	5708.5	6886.6	5888.5

*The House of Representatives passed the NASA Authorization Bill, H.R. 2065, by voice on April 26.

†These figures are the results of the budget markup of the Senate version of the NASA Authorization Bill, S. 1098, by the Senate Committee on Commerce, Science, and Technology on April 21. The bill is expected to be voted on by the entire Senate by mid May.

‡Includes solid earth observations, environmental observations, materials processing in space, communications, and information systems.

The IMS Source Book

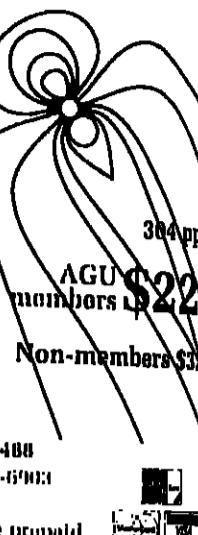
Guide to the International
Magnetospheric Study Data Analysis
C.T. Russell and D.J. Southwood, editors

The International Magnetospheric Study, or IMS, was a coordinated effort to advance the knowledge of the dynamics of the magnetosphere, in particular to study the response of the near-earth environment to varying conditions in interplanetary space.

This book identifies the "What, When and How" of the major IMS satellite, ground-based rocket and balloon programs and tells whom to contact for the data. Also covered are many of the conventional and innovative IMS workshops including the Coordinated Data Analysis Workshop—a computer based, event oriented multi-data set approach that proved very successful.

This book serves both the active researcher involved heavily in the IMS from the beginning and those who would like to gain entry into the IMS study effort.

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Lowell P. Weicker, Jr. (R-Conn.), questioned NOAA Administrator John V. Byrne about the impact closing the laboratory would have on environmental research in the Great Lakes. "We anticipate a certain amount of research to continue at regional universities and through other federal agencies," Byrne told Weicker. Although changes will result from closing the laboratory, "much of the research will continue," Byrne added.

Before the hearing, another NOAA staffer indicated that some projects would simply be terminated if the laboratory were to close, while others may be transferred to the Pacific Marine Environmental Laboratory in Seattle or to the Atlantic Ocean and Meteorological Laboratory in Miami, the other two wet laboratories in the NOAA system. GLERL Director Aubert argued that the transfer of research projects is highly unlikely. He stressed that the older laboratories are geared mostly toward heavy metal research; GLERL investigates the biology of lake systems and operates a lake hydrology research group that is unique among the ERL. Furthermore, NOAA would not be able to absorb or relocate the personnel involved, Aubert said. A source at NOAA stated that individuals would have to choose to resign, to apply for positions in other parts of NOAA, or to retire, depending on their age and years with the government. The bulk of the research could be conducted by the states in the region, but this could cause a great financial and administrative burden on the states, according to the NOAA staffer.

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Positions Wanted: first insertion \$1.75, additional insertions \$1.00.
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Replies to ads with box numbers should be addressed in Box _____, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

For further information, call toll free 800-424-2488 or, in the Washington, D.C. area, 462-6903.

POSITIONS WANTED

Hydrologist/Environmental Scientist. Ph.D. research scientist seeks a research/teaching position. Research interests include soil water dynamics, watershed modeling, hydrology, and water transport. Interested also in climatology and ecology. Would consider also a nonacademic job. Box 018, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

POSITIONS AVAILABLE

Sedimentologist. Lamont-Doherty Geological Observatory of Columbia University seeks a postdoctoral with strong research interests in tectonics and computational methods applicable to digital network data from a major seismic gap at a subduction zone. Participation in ongoing research program and development of future research proposals are expected. Depending on applicant's experience and qualifications, the position may be filled at either the postdoctoral or associate research scientist level. Send resume, with publications or manuscripts and at least three references to: Dr. Klaus Jacob, Lamont-Doherty Geological Observatory, Palisades, NY 10564.

Columbia University is an equal opportunity/affirmative action employer.

Geology (with emphasis on petrology)/University of California, Berkeley. Visiting Lecturer position beginning 1 September 1983. Although the initial appointment will be as a lecturer, and is annually renewable, the appointment could lead to a ladder faculty position next year.

Applicants should be at the time of application at the graduate level and able to teach several of Petropetrology, Mineralogy, Geochemistry, Field Geology, Physical Geology, and Research Methods. Application should be submitted to: Dr. Lewis H. Cohen, Department of Earth Sciences, University of California, Berkeley, California 94720.

The University of California is an Equal Opportunity/Affirmative Action Employer.

Bureau of Mineral Resources, Australia/Marine Geophysicist. The Australian Bureau of Mineral Resources, Geology and Geophysics (BMR) is charged with developing an integrated, comprehensive, scientific understanding of the geology of the Australian continent and offshore areas as a basis for mineral exploration.

The Division of Marine Geosciences and Petroleum Geology undertakes a wide range of regional offshore geological and geophysical investigations, and is responsible for the analysis and integration of geoscientific data collected by private petroleum exploration companies offshore.

The Division is seeking a Marine Geophysicist to analyse data on the stratigraphy, structure and evolution of Australian continental margin.

Research experience in seismic stratigraphy is highly desirable. Experience in burial and thermal geohistory analysis would be valuable.

Classification will be Principal Research Scientist. Depend on Senior Principal Research Scientist dependent on the successful candidate's qualifications and experience.

QUALIFICATIONS: A Ph.D. (or equivalent) together with demonstrated research ability.

SALARY: Principal Research Scientist (PRS) - \$43,830-\$44,770; Senior Principal Research Scientist (SPRS) - \$44,260-\$44,670.

ON-TIME PAY: Conditions of service include annual leave, long service leave, four weeks annual leave and remuneration to Canberra. Permanent appointment is available to persons who are British citizens eligible for permanent residence in Australia. A term engagement would be considered for persons not meeting this criterion.

Applications together with full personal and professional details and the names of at least three referees should be sent to:

11 Director
Bureau of Mineral Resources
P.O. Box 578
CANBERRA CITY, ACT 2601
AUSTRALIA
Applications close 3 June 1983.

Postdoctoral Research Associate in Plasma Theory. The Department of Physics, University of Denver invites applications for a research position in space plasma theory group.

Candidate should hold Ph.D. in plasma theory with strong background in quasilinear and nonlinear theory of plasma instabilities, including numerical methods and computer simulation techniques.

The position is suitable for a recent Ph.D. recipient. Candidates with one or two years of post Ph.D. experience with successful publication record will also be considered. The research program in space plasma include wave mechanisms, ion beam instabilities and parametric instabilities. The project requires finite difference processing of space plasma field and data for theoretical support. Experience in space plasma desirable but not essential, familiarity with CRAY-1 computer is useful.

The position is available starting October 1983. Initial appointment is for one year, possibly with qualifications.

Send curriculum vitae, and the names of three referees to: Professor V.L. Patel, Department of Physics, University of Denver, Denver, CO 80208.

Research Associate. The Stanford University School of Earth Sciences and the Center for Materials Research seek research-oriented scientist for an initial three-year appointment to start approximately October 1983. Duties will include supervision and maintenance of a new XRF-XRD facility, supervision of a new ESCA spectrometer, and operation of our microprobe technician in optimizing software for geological applications.

Duties will include training faculty and student users of the XRF-XRD, and ESCA, but not service work. Experience in operation of XRF, XRD, and/or electron microscope required; we will train on the ESCA. Good working knowledge of DEC 11/33 computer (1102, 1132, 1152) operating under VMS, VMS monitor, and FORTRAN level programming is essential. Although we envision that the duties associated with this new equipment will constitute a full-time job for a year or two, we prefer Ph.D.-level applicants who desire eventually to develop their own research program in conjunction with Stanford faculty.

Send resume to: Dr. Mahood, Department of Geological Sciences, Stanford, CA 94305. Stanford University is an equal opportunity/affirmative action employer.

Research Scientist(s) in Space Physics. The Laboratory for Atmospheric and Space Physics at the University of Colorado announces openings for one or more research scientists.

The successful candidate(s) will join our experimental research programs in solar terrestrial physics and planetary atmospheres. LASP has ongoing sounding rocket and satellite programs dedicated to the development of state-of-the-art instruments for space research.

An advanced degree is required; a background in solar, planetary or atmospheric sciences is desirable, although experience in related areas will be considered. Salary commensurate with experience.

Applications, including a current professional resume and the names of three references should be sent by June 10, 1983, to:

Dr. Charles A. Barth, Director
Laboratory for Atmospheric and Space Physics
Campus Box 829
University of Colorado
Boulder, CO 80309.

THE UNIVERSITY OF COLORADO IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

Research Associate. The Earth Resources Laboratory of the Department of Earth and Planetary Sciences is seeking a research staff member for digital full waveform acoustic log data analysis.

The applicant should have a Ph.D. in geophysics or related engineering/computer science with at least three years industrial experience with well log analysis.

Duties will include the development of data analysis package for full waveform acoustic log, initializing new data analysis techniques and directing the handling of digital data at the Earth Resources Laboratory. Individual will also be expected to supervise a program and data transfer between ERL and members of the full waveform acoustic logging consortium.

Please state minimum salary requirements. Resumes should be submitted to:

Professor M.N. Toksoz
c/o Vera Ballard
E19-238
M.I.T.
Cambridge, MA 02139

MIT is an equal opportunity/affirmative action employer.

Research Associate/Petrography-Petrology. To join a research effort aimed at understanding the conduction history of the solar system by mineralogical, chemical, and isotopic studies of tiny inclusions in primitive meteorites. Applicant need not have a Ph.D. in geology, but should have a B.S. and should be a superb petrographer, skilled in the use of the SEM and electron probe. Successful candidate will be dedicated, productive, an effective communicator both orally and in writing, and will have Ph.D. in hand. Vacancy expected in late summer or early autumn 1983.

Send resume and names of three references to: L. Grossman, Department of Geophysical Sciences, University of Chicago, 5734 S. Ellis Avenue, Chicago, IL 60637.

The University of Chicago is an equal opportunity/affirmative action employer.

Geology (with emphasis on petrology)/University of California, Berkeley. Visiting Lecturer position beginning 1 September 1983. Although the initial appointment will as a lecturer, and is annually renewable, the appointment could lead to a ladder faculty position next year.

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